

REMARKS

Claims 1-22 and 27-40 are pending in this application. Claims 27-34 are allowed; and Claims 39 and 40 were objected to but indicated as being allowable if re-written in independent form.

Objections were made to Applicant's use of the trademark Velcro™. Accordingly, the term "Velcro™" has been changed to: VELCRO™ hook and loop material in the specification and in Claims 7 and 34.

Claim Rejections

Claims 1, 2, 7-11, 13, 14, 16-22, and 35-38 are rejected under 35 U.S.C. 102(e) as being anticipated by *Dvorak* (U.S. Patent No. 6,298,765).

Claims 3-6, 12, and 15 are rejected under 35 U.S.C. 103(a) as being unpatentable over *Dvorak*.

These rejections are respectfully traversed, and reconsideration of the rejected claims is respectfully requested.

The Claimed Invention

The present invention, as recited in amended claim 1, is directed to a particle shield designed to provide reliable protection against hypervelocity particles. The particle shield is comprised of a plurality of flexible shield layers adjacent to resilient support layers. A protective layer encloses the flexible shield layers. In one preferred embodiment, a back wall serves as the last layer of protection within the protective cover. Fasteners secure the particle shield to the structure to be protected.

Independent claim 17 is directed to a system for providing reliable protection against hypervelocity particles. The system comprises means for shocking the particles and means for supporting the shocking means. The system also consists of means for enclosing the shocking means in a cover layer and means for securing the shocking means to the desired structure to be protected.

Allowed independent claim 27 is directed to a hypervelocity particle shield comprising a plurality of flexible shield layers, at least one of which is made of a flexible ceramic fabric,

adjacent to resilient support layers, at least one of which is a space qualified foam layer. The at least one flexible shield layer has an areal density that is substantially equal to a predetermined constant times a hypervelocity particle's cubic density multiplied by its diameter. The shield also comprises a thermal insulation layer on top of the shield layers and a back wall protector underneath the shield layers to serve as a final layer of protection. An abrasion resistant protective cover serves to enclose the flexible shield layers and has vents on a periphery thereof to facilitate venting. Fasteners are capable of releasing and securing the flexible shield layers to the structure.

Allowable Subject Matter

Applicants acknowledge the Examiner's indication of allowable subject matter in claims 27-34.

Arguments in Support of the Claims

Applicants respectfully submit that *Dvorak* is not enabling for what the Examiner contends it teaches and is not anticipatory prior art. As set forth in Applicants' amendment of 29 July 2003, a long standing principle in U.S. patent jurisprudence requires that a prior art reference must be enabling for what it discloses. ("No doctrine of the patent law is better established than that a prior patent or other publication to be an anticipation must bear within its four corners **adequate directions for the practice of the patent invalidated.**" *Dewey & Almy Chem. Co. v. Mimex Co.*, 124 F.2d 986, 990, 52 USPQ 138 (2d Cir. 1942) emphasis added; "Even if the claimed invention is disclosed in a printed publication, that disclosure will not suffice as prior art if it was not enabling." *Helifix Limited v. Blok-Lok, Ltd.*, 208 F.3d 1339, 1347; 54 USPQ2D 1299 (Fed. Cir. 2000) citing *In re Donohoe*, 766 F.2d at 533, 226 USPQ 619 (Fed. Cir. 1985).) It is respectfully submitted that, particularly in view of the highly specialized and unique nature of the subject matter of the *Dvorak* patent and the harsh and unusual environmental conditions for which it is intended, combined with the almost total lack of teachings in the specification as to how one could practice the invention, as will be demonstrated below, the *Dvorak* reference is not an anticipatory reference relative to Applicant's claims as presently presented

With regard to claims 1 and 17, although *Dvorak* discloses a plurality of shield layers, the specification and drawing of the *Dvorak* patent provide no teaching as to how to construct and apply the shield assembly for achieving its stated function, i.e., providing a shield assembly “for protecting a spacecraft surface from hypervelocity impactors,” much less the provision of a “system for providing reliable protection against hypervelocity particles.” As will be understood by those in the art, the design criteria and successful application of multi-layer M/MOD shielding in actual practice in exoatmospheric applications is not straightforward and entails a thorough knowledge of and application of disciplines such as physics, mathematics, material reaction under shock, etc., in addition to extensive testing and design experience. Thus, a mere suggestion that it would be beneficial to combine multiple layers of foam layers and ceramic bumper sheets and to enclose the assembly in an outer protective covering is clearly not an enabling disclosure. Instead, the ‘765 *Dvorak* patent provides only a brief, cursory discussion of how the flexible shielding is to be constructed and practiced.

As is apparent from a careful reading of the *Dvorak* patent, its specification and drawings fail to disclose or even suggest the relationship between the shielding materials, thickness of the layers, and distances or spacing between the layers with the particle size that can be “shocked.” Without this information, Applicants respectfully submit that a person of ordinary skill in the art would not be able to determine the amount of shielding required to **reliably** protect the spacecraft against a given sized particle and, therefore, would not be able to practice the claimed invention. Thus, a person of ordinary skill in the art would have no information that would suggest the feasibility or operability of the apparatus, or suggest potential design factors entailed in its construction, but instead would have only a vague suggestion of an undefined concept. In actual practice for applications in exoatmospheric space, for example, a shield that is too small (i.e., thin) cannot provide adequate protection against dense particles commonly experienced during orbital space flights. However, a shield that is too large (i.e., thick) may be overkill and, more importantly, may be prohibitive in terms of the excessive materials cost and cost to transport the shield into orbital space. This position is supported by the declaration under 37 C.F.R. 1.132 of Dr. Eric L. Christiansen, Ph.D, submitted in Applicants’ previous response. Instead, the only teaching or suggestion in the *Dvorak* patent relative to the construction of the open-cell foam “support” layers (element 18 in the patent) is a brief suggestion that the reader is

encouraged to try various thicknesses and constructional relationships to see what may work for a given application. In this regard, the Examiner's attention is directed to the following excerpt from the *Dvorak* patent:

"The element 18 is preferably is in a thickness of between about ¼ inch to 4 inches, depending on the desired performance of the shield assembly." [column 3, lines 59-61, emphasis added]

No further suggestion is made as to how to predict or even approximate the construction of the structure, or to calculate the thicknesses and/or spacings between bumper layers, etc. Thus, the description in the *Dvorak* specification is of only a general, suggestive nature; it does not provide any teaching or even "hints" as to how a person of ordinary skill in the art would apply the concept to spacecraft protection." No suggestion or teaching is provided as to how the various components should be sized or constructed to achieve a desired level of protection from the impact of a hypervelocity impactor of a given density, mass, velocity, and impact angle, etc. It is thus apparent that the apparatus disclosed in the patent is in the nature of an incomplete "concept," and that large investments of resources, time, technical expertise, etc., would be necessary to assess how to construct, assemble, and incorporate the shielding to achieve a necessary level of protection for applications in exoatmospheric space. Additionally, there clearly is no teaching in the reference of a particle shield "particle shield designed to provide reliable protection against hypervelocity particles," Applicant's Claims 1 and 17. The specification clearly does not include a "written description of the invention, and of the manner and process of making and using it, in such full, clear, concise, and exact terms as to enable any person skilled in the art to make and use the same." (In contrast, see, for example, Applicant's specification, e.g., pages 14, line 1, through page 15 line 15, referencing Figs. 7 and 8, in which one skilled in the art is provided instructions, formulas, and guidelines relative to the design and requisite thickness and spacings of the components for designing the shield assembly, and the further disclosure provided in 8-13 regarding the construction of the structure and its components and materials.)

As to whether one of average skill in the art, having the *Dvorak* patent, would be able to construct and implement such a structure absent the teachings of Applicant's specification, in

addition to Dr. Christiansen's declaration, mentioned above, Applicants also reference the previously submitted declarations under 37 C.F.R. 1.132 of Dr. Charles E. Anderson, Jr., Ph.D. and Dr. Lalit C. Chhabildas, Ph.D., both of whom are highly regarded experts in the field of hypervelocity impact protection systems. As can be seen from their declarations, neither Dr. Anderson nor Dr. Chhabildas consider *Dvorak* as disclosing the information necessary for a person of ordinary skill in the art to practice the claimed invention. Moreover, they feel that this information is not information that a person of ordinary skill in the art would know or can easily derive. As such, Applicants respectfully submit that *Dvorak* is simply not enabling and is not appropriate prior art for purposes of anticipating claims 1 and 17. The patent is thus merely a vague and incomplete suggestion and not an anticipatory reference under 35 U.S.C. 102(e). It is further considered invalid for lack of an enabling disclosure pursuant to 35 U.S.C. §112. It is respectfully contended that the patent is not a valid or anticipatory reference. Accordingly, withdrawal of the rejection against these claims is respectfully requested.

With regard to claim 36, Applicants again note that this claim specifies that vent holes are located in a **peripheral side wall** of the shield. In contrast, the outgassing/venting holes disclosed in *Dvorak* are located on the face of the shield. This location does not allow built up pressure within the *Dvorak* shield to be properly released. As particles impact and penetrate the shield layers, the resulting plume of debris and gases expands outwardly in all directions, including laterally between the intact portions of the shield layers where they are trapped. As a result, a significant amount of debris and gases would not be able to escape through the *Dvorak* vent holes, which are located on the face of the shield.

With regard to claim 38, while it may be inherent in the art to have a shield wherein the thickness of the shielding is based on the size of the projectile it is designed to shield, as discussed above, the information necessary to design such a shield is not readily known to, or derivable by, persons having ordinary skill in the art. (See the attached declarations.) Since *Dvorak* does not disclose or suggest the necessary information, Applicants respectfully submit that *Dvorak* is not enabling for purposes of anticipating claim 38. With respect to dependent claims 2-16, 18-22, and 35-40, in addition to their recitation of independently allowable subject matter, these claims depend from claims 1 and 17, respectively, and are therefore allowable for at least the same reasons provided above. Regarding the rejections of the claims dependent upon

Claims 1 and 17, it is thus respectfully maintained that, when considered in combination with the limitations present in the independent claims, the combinations of elements recited in each are distinguished over and not obvious in view of the *Dvorak* reference, for essentially the same reasons provided above and also in view of the further limitations incorporated in the respective claims. It is respectfully submitted that it is improper to consider the patentability of such dependent claims independently of the combinations of elements incorporated in both the respective dependent claims and the claims from which they depend. Accordingly, withdrawal of the rejection against dependent claims 2-16, 18-22, and 35-40 is respectfully requested.

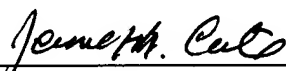
Concerning the rejection of Claims 3-6, 12, and 15 under 35 U.S.C. 103(a) as being unpatentable over *Dvorak*, for essentially the same reasons provided above, Applicants contend that nothing in cited patent would teach or suggest the combinations of elements recited in the rejected claims. Reconsideration and withdrawal of this rejection is respectfully requested.

CONCLUSION

The rejections and objections raised by the Examiner have been addressed, and Applicants believe that the claims are now in condition for allowance, which action is respectfully requested. If any questions or issues remain and the resolution of which the Examiner feels will be advanced by a conference with the Applicants' attorney, the Examiner is invited to contact the attorney at the number noted below.

The Commissioner is hereby authorized to charge any fee which may be required, or credit any overpayment, to Deposit Account No. 14-0116.

Respectfully submitted,



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